

HIGH LEVEL CIVIL ENGINEERING ASSESSMENT

Stage 1 – Lot 1 DP53506, Goffe Drive, Haruru

Prepared for Andre Galvin

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It should be appreciated that this assessment was based on a visual assessment only.



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1 Introduction

Vision Consulting Engineers Limited (VISION) has been engaged by Andre Galvin to provide engineering services for the proposed subdivision of Lot 1 DP53506, Goffe Drive, Haruru. It is understood that the client wishes to subdivide the property to create 13 lots.

The project has been split into two stages, with Stage 1 being a high level engineering assessment to provide a preliminary overview of the project and identify potential challenges and opportunities to inform the concept development of the subdivision layout. The engineering reporting to support the submission of a resource consent application is to be carried out as Stage 2.

This report provides the findings of Stage 1 which aims to conduct a high-level civil engineering assessment of the property.

1.1 Scope and Exclusions

The following scope of work is proposed:

- **Desk Study:** Familiarise with information regarding the proposed development. Conduct a highlevel assessment reviewing published and unpublished information about the site, including undertaking a geomorphological assessment using historic aerial images and NRC LiDAR data. Assess natural hazards, potential house sites, internal access, stormwater, wastewater and water supply.
- **Preliminary Recommendations:** Preparation of a report summarising the findings of the assessment and providing preliminary recommendations regarding the feasibility of the subdivision and potential engineering requirements.
- **Client Meeting:** Conduct a meeting to discuss the findings of the assessment and answer any questions.

2 Property Description

The subject property is the Lot 1 DP53506 and is 69,960 m² in area. The property is bounded by residential lots to the west and north, estuary to the east, and Puketona Road/State Highway 11 (SH11) to the south. The location of the site is presented in Figure 1.

The property is currently undeveloped and is generally covered in bush. A small area in the southeastern portion of the property has recently had fill placed and consists of bare earth. The majority of the property slopes moderately to steeply to the north/north-east, with the south-eastern portion of the property sloping gently to steeply to the south-east.

Basic details of the property are provided in Table 1.



Table 1. Property Details

Data relating to this site

Item	Details
Territorial Authority	Far North District
Site Address	-
Legal Description	Fee Simple, 1/1, Lot 1 Deposited Plan 53506
Area	69,960m2
Operative DP Zoning	General Coastal
Proposed DP Zoning	Rural Production



Figure 1. Property location *The property is highlighted red, north to top of page, boundary approximate only, image from LINZ.*

3 Geology

The 1:250,000 geological map, Geology of the Whangarei Area (Ebrooke and Brook et al 2009) indicates that the property is underlain by the Waipapa Group comprising massive to thin bedded, lithic volcaniclastic metasandstone and argillite, with tectonically enclosed basalt, chert and siliceous argillite.

Landcare Research (Harmsworth, 1996) have mapped the property as being underlain by Rangiora clay, clay loam and silty clay loam being soils of the rolling and hilly land, imperfectly to very poorly drained.

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4 Proposed Development

It is understood that at a conceptual level the client intends to develop the property to include in the order of fourteen dwellings, several buildings that contain units, a community storage space, information centre, café and visitors centre, wharf, carparks, a woodland walk/tree top walk and vehicle access. Access to the property is to be from Puketona Road and via a Right of Way (ROW) from Goffe Drive.

5 Geomorphology

The property is located on the north-eastern and south-eastern slopes of a ridgeline that roughly follows the alignment of Goffe Drive. The majority of the property slopes moderately to steeply to the north-east, with the southern portion of the property sloping gently to steeply to the south-east. A small area in the southern corner of the property is generally flat and slopes down to the estuary. Beyond the eastern property boundary, are the flats of the estuary.

The geomorphology of the area is shown in Figure 2 below using a digital elevation model derived from the 2018 Northland Regional Council (NRC) Light Detection and Ranging (LiDAR) dataset and 1m contours.

The property is located within an area that has experienced historic land movement. The dwellings located on the northern side of Goffe Drive appear to have been constructed along a ridgeline. It is considered that earthworks have been carried out to form relatively flat building areas with fill material pushed out to the north. Numerous historic landslips can be seen extending down from the relatively level building areas on Goffe Drive, extending down to the base of the hillside. Historic landslip features can also be observed on the southern side of Goffe Drive that also extend to the base of the hillside. A number of more stable spur ridges extend from the ridgeline between the landslips.

A number of access tracks are present, located near part of the eastern property boundary, and the south-western property boundary that have been cut into the hillside, with fill inferred to have been pushed out to create relatively level access tracks. Fill is also inferred to be present near part of the eastern property boundary where what appears to be a ramp extends down to the estuary and in the southern portion of the site near Puketona Road/SH11.





Figure 2. Site Geomorphology Site boundaries indicative only, contours are shown at 1m intervals with blue shading lower elevations and green shading higher elevations, north is up the page. DEM courtesy of NRC

6 Historic Aerial Images

Historic aerial images of the property from 1951 and 1971 were obtained from Retrolens, LINZ and the VISION archives and were reviewed as stereopairs.

The historic aerial image from 1951 is presented in Figure 3. In the image, the area surrounding the site is mainly undeveloped, with Puketona Road/SH11 present.

A historic aerial image from 1971 is presented in Figure 4. In the image, Goffe Drive has been formed with some houses present and earthworks taking place. On the subject site, what appears to be a quarry is present in the southern portion of the property along with earthworks near the western property boundary and part of the eastern property boundary. Fill is also inferred to be present near part of the eastern property diacent to the estuary.





Figure 3. Retrolens 1951 Aerial Image North at top of page, historic aerial image from Retrolens, approximate property boundary shown in red.



Figure 4. Retrolens 1971 Aerial Image North at top of page, historic aerial image from Retrolens, approximate property boundary shown in red.

The geomorphology observed in the historic aerial images from 1951 and 1971 is considered to be relatively consistent with the geomorphology presented in Figure 2, with numerous historic landslips seen extending down from the ridgeline (currently Goffe Drive), extending down to the base of the



hillside. Several more recent slips can be observed in the larger features. A number of more stable spur ridges extend from the ridgeline between the landslips.

7 EQC Claim Portal

The Earthquake Commission (EQC) Natural Hazards Portal Claim Map shows that a number of properties in close proximity to the subject site have had EQC claims made due to natural hazards affecting the property. Claims have been made at 16, 18, 20, 22, 28, 30, 44 and 44a Goffe Drive and at 2 Kaipariki Rise between 2007 and 2008. From the portal, the claim event type are shown to be Storm or Flood and Landslip, with the claim type being Land or Building, Land. Based on this, it is expected that the properties have been affected by land movement. Please note that the EQC files have not been obtained as a part of this assessment. An extract from the portal map showing the location of the claims is presented in Figure 5.



Figure 5. EQC Claims North at top of page, extract from EQC Claims Portal. Green dots indicate EQC claims

8 Council Hazard Mapping

The Northland Regional Council (NRC) and Far North District Council (FNDC) hazard layers have been reviewed. According to the NRC and FNDC hazard layers the properties are <u>not</u> located in an area susceptible to:

- Landslide
- Erosion

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Coastal Erosion

8.1 FNDC Flooding

A small portion in the northern extent of the property is mapped by the FNDC as being affected by flooding. An extract from FNDC maps presenting the extent of flooding is presented in Figure 6.



Figure 6. FNDC Flood Extent North at top of page, extract from FNDC Maps



8.2 NRC Coastal Flooding

The site is mapped by the NRC as being affected by the predicted current, 50-year and 100-year coastal flooding events as shown in Figure 7. The predicted extent of flooding is limited to the area adjacent to the north-eastern and eastern property boundaries and in the southern portion of the property adjacent to Puketona Road/SH11.



Figure 7. NRC Coastal Flood Extent North at top of page, extract from FNDC Maps

8.3 NRC River Flooding

The property is not mapped as being affected by the NRC River Flood model and the Region Wide Flood model.



9 Existing FNDC Services

FNDC maps indicate that there is water supply and wastewater reticulation services present in the vicinity of the site as outlined in the following sections. There are no stormwater

9.1 Wastewater Reticulation

FNDC maps indicate that a 450mm diameter PE Rising Main present in the road reserve of Puketona Road/State Highway 11, near the southern property boundary. A 150mm diameter uPVC Gravity Main is present along the northern side of Goffe Drive that terminates at a manhole located adjacent to 34 Goffe Drive. An extract from FNDC maps showing the location of wastewater reticulation in close proximity to the site is presented in Figure 8.



Figure 8. Wastewater Reticulation Services North at top of page, extract from FNDC Maps



9.2 Water Reticulation

FNDC maps indicate that a 150mm AC and 200mm uPVC diameter Pump Supply Mains are present within the road reserve of Puketona Road, near the southern property boundary. A water supply tank is present at 40 Goffe Drive. A 40mm diameter uPVC rider main, 150mm AC diameter pump supply main and 150mm diameter AC pipe main appear to be connected to the tank. An extract from FNDC maps showing the location of water reticulation in close proximity to the site is presented in Figure 9.



Figure 9. Water Reticulation Services North at top of page, extract from FNDC Maps



10 High Level Civil Engineering Assessment

The following high level civil engineering assessment is provided based on our desktop study.

10.1 Geotechnical

Based on the desktop assessment, including a geomorphic analysis of historic aerial images, LiDARderived contours, and our extensive experience in the local area, the ground conditions at the property are expected to comprise residual soil and weathered rock of the Waipapa Group, colluvium (landslip debris), and potentially alluvial materials near the estuary. Site-won fill is also anticipated in areas where previous site work has occurred. A disused quarry is present within the southern portion of the property.

The property is located within an area that is susceptible to landslide movement. The geomorphological assessment identified numerous historic landslips that extend from the ridgeline down to the base of the hillside. It is inferred that smaller recent landslips are located within several larger landslips. Additionally, a review of the EQC claims portal indicates that neighbouring properties along Goffe Drive have land movement and associated damage.

While this desktop study provides valuable insights, it's important to acknowledge its limitations. Without on-site geological mapping and intrusive geotechnical testing, definitive statements about slope stability and ground conditions cannot be made.

However, the identified geotechnical hazards suggest that careful consideration must be given to the development of the property. It is anticipated that engineer-designed retaining structures and slope stabilisation works are likely required to form suitable internal accessways, parking areas, and building platforms. Potential mitigation measures could include dewatering slopes, re-grading, retaining, and mechanically stabilised earth systems.

The intensity of development achievable on the site will be influenced by the need to effectively mitigate the identified geotechnical constraints. A collaborative approach between the developer and geotechnical engineers will be essential to achieve a balance between development goals and site stability.

Recommendations:

- Comprehensive Geotechnical Assessment: To support the proposed development, a comprehensive on-site geotechnical assessment is essential. This should include:
 - Detailed geological mapping.
 - Intrusive investigations (e.g., boreholes, trial pits) to characterize subsurface conditions.
 - Slope stability analysis.
 - Design and reporting on appropriate mitigation measures.
- Chartered Professional Engineer: This assessment should be conducted by a Chartered Professional Engineer with expertise in geotechnical engineering.

10.2 Internal Access

The proposed development requires new internal accessways to provide vehicular and pedestrian acess to the individual house sites. Access will be provided from Puketona Road in the southern portion of the property and a right of way that extends from Goffe Drive.

Given the moderately to steeply sloping terrain, earthworks will be necessary to form suitable accessways. Cut and fill slopes will likely require retaining walls or other stabilisation measures. The design of the accessways will need to be informed by a comprehensive geotechnical assessment to ensure stability and minimise potential land disturbance.

Key design considerations for the internal accessways will include:



- Compliance: Accessways designed in accordance with the FNDC Engineering Standards and the District Plan.
- Geometry: Appropriate carriageway widths, gradients, and turning radii provided to ensure safe and efficient vehicle movement.
- Pavement: Sealed accessways to the urban standard are anticipated for the site.
- Drainage: A comprehensive drainage system will be needed to manage stormwater runoff from the accessways, incorporating kerb and channel or open drains as appropriate. Discharge points will be carefully selected to prevent erosion or adverse impacts on the estuary. Water quality treatment measures may be incorporated as necessary.
- Serviceability: Accessways will be designed to accommodate the installation of underground services, including water supply, wastewater, telecom and power.
- Safety: Adequate sight distances, pedestrian access, and other safety features will be incorporated into the design.

Construction and Supervision:

Construction of the accessways will need to be undertaken by experienced contractors and supervised by a qualified engineer to ensure compliance with the approved design and relevant standards.

10.3 Stormwater

A stormwater system's key objective is to protect people, their activities, properties, and environmental values. A stormwater system consists of:

- Primary Network: A primary network of pipes and culverts designed to effectively convey the 10% AEP design storm event without surcharge, considering an allowance for climate change.
- Secondary Network: A secondary network of overland flow paths designed to safely manage stormwater runoff exceeding the capacity of the primary network or during blockages. This secondary system is capable of conveying the 1% AEP storm event within a defined paths, preventing undue risk or damage to persons or property. The location and capacity of these overland flow paths will need to be carefully determined to ensure they are integrated with the site's natural features and do not create erosion or ponding issues.

The property is note currently serviced by a reticulation system.

The proposed development will need to include a stormwater reticulation system, carefully designed considering the following:

- Geotechnical Constraints: The design will need to carefully consider the geotechnical constraints identified in the geotechnical assessment to ensure the stability of the system and minimise potential erosion.
- Erosion and Sediment Control: Erosion and sediment control measures, including sediment basins and silt fences, will need to be carefully implemented during and after construction to minimise sediment runoff and protect the estuary.
- Water Quality Treatment: To protect the receiving environment, appropriate water quality treatment measures, such as rain gardens, swales, or proprietary products, will need to be incorporated to remove pollutants and protect the receiving environment.





- Outfalls: Stormwater will be discharged to the estuary via appropriately designed outfalls, considering the potential impacts on the coastal environment. Outfall locations should be selected to minimise erosion and prevent adverse effects on water quality.
- Professional Design: The design of the stormwater management system will need to be undertaken by a Chartered Professional Engineer with experience in stormwater management.

10.4 Wastewater

The proposed development is to include a low pressure reticulation network to collect and convey wastewater from each dwelling to the existing FNDC gravity sewer main located on Goffe Drive. A proposed right-of-way from Goffe Drive will facilitate the connection.

The property currently does not have a wastewater connection. To service the proposed development, a comprehensive wastewater management system will be designed in accordance with the FNDC Engineering Standards.

The proposed development will need to include a wastewater reticulation system, carefully designed considering the following:

- Grinder Pumps: Equipping each dwelling with a grinder pump (e.g., E/One or similar) to facilitate efficient pumping through the low-pressure network.
- Network Capacity: The reticulation network designed with adequate capacity to handle the anticipated wastewater flow from the proposed development, considering the number of dwellings and estimated water usage.
- Pipe Material and Sizing: Appropriate pipe materials and sizing selected to ensure durability and minimise friction losses.
- Manholes and Access Points: Manholes and access points strategically located to facilitate maintenance and inspection of the network.
- Connection to FNDC System: The connection to the FNDC gravity sewer main on Goffe Drive will need to be designed to ensure compatibility and prevent any adverse impacts on the existing system.
- Professional Design: The design of the wastewater management system will need to be undertaken by a Chartered Professional Engineer with experience in wastewater reticulation design.

10.5 Water Supply

The property currently does not have a water supply connection. To service the porposed development, a water supply system will need to be designed in accordance with the FNDC Engineering Standards.

The proposed system will need to connect to the existing reticulated main on Goffe Drive via a proposed right-of-way.

As an alternative to connecting to the FNDC reticulated supply, on-site water tanks could be considered for potable water and firefighting purposes. If this option is pursued, the requirements for water storage for firefighting purposes will be assessed by Fire and Emergency New Zealand, and the system will be designed to comply with relevant standards for rainwater harvesting and storage.

The proposed development will need to include a water reticulation system, carefully designed considering the following:



- Demand Assessment: The estimated water demand for the proposed development calculated based on the number of dwellings, anticipated occupancy rates, and typical water usage patterns. This assessment will ensure the proposed system can adequately meet the needs of the development.
- Firefighting Requirements: Fire hydrants installed throughout the development in accordance with SNZ PAS 4509:2008 to ensure adequate firefighting water supply. The location and spacing of hydrants will be carefully determined to provide effective coverage and comply with relevant fire safety regulations.
- Infrastructure Design: The water supply infrastructure designed to ensure adequate pressure and flow to all dwellings. This will involve selecting appropriate pipe materials and sizes, considering factors such as demand, pressure losses, and potential future expansion.
- Professional Design: The design of the water supply system will be undertaken by a Chartered Professional Engineer with experience in water reticulation design.

11 Summary

By considering the recommendations of this report and addressing the various aspects outlined in this report, it is considered that development at the property can address the management of natural hazards, geotechnical, internal access, stormwater, wastewater and water supply.

• Geotechnical Considerations:

The property is located within an area that is susceptible to landslide movement. Careful consideration needs to be given to development of the property taking into account the geotechnical hazards present to protect the subject property and adjacent properties from the risk of slippage. It is anticipated that engineer designed retaining structures and slope stabilisation works will be required to be able to form suitable internal access ways, car parking and building areas. Comprehensive onsite geological mapping, geotechnical investigation, analysis, design and reporting is recommended to support development of the property.

Internal Access:

Earthworks will be required to form suitable internal access roads, with cuts and fills likely to require retaining and/or stabilization works. The internal access will need to be designed taking into consideration the geotechnical constraints present at the property. Either kerb and channel or open drains will be required to convey stormwater from internal access ways discharging to an appropriate outlet.

• Stormwater:

The development is to include a stormwater reticulation system and secondary overland flow paths designed to take into account geotechnical constraints and work in conjunction with internal access ways, proposed building areas and natural site features. The stormwater management devices are to discharge to the estuary via appropriately designed outfalls/outlets. Due to the property being adjacent to the estuary, stormwater attenuation is not considered to be required.

• Wastewater:

A low pressure wastewater reticulation system is proposed to collect and convey wastewater to the FNDC gravity wastewater reticulation system that is present on Goffe Drive. Each new building will have a grinder pump (E/One or similar) installed.

• Water Supply:



The development is to be serviced by a new water supply reticulation system that connects to the existing water supply reticulation on Goffe Drive, via a proposed ROW. Fire hydrants are to be installed in general accordance with SNZ PAS 4509:2008 New Zealand Fire Service firefighting water supplies code of practice.

Alternatively, onsite water tanks could be utilised for potable water and fire fighting water supply. If onsite water supply is proposed, requirements for the provision of water storage for fire fighting purposes is to be assessed by the Fire and Emergency New Zealand.

This high-level assessment has been conducted to identify potential engineering constraints and opportunities associated with the proposed subdivision and rezoning of Lot 1 DP 53506, Goffe Drive, Haruru. It is intended to support the rezoning application and inform the concept design. Further detailed engineering investigation, analysis, and design, as outlined in this report, will be required to address the identified constraints and support a resource consent application for the development.

